Do elephants eat more trees when less grass is available? A field study in Kruger National Park, South Africa.

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Do elephants eat more trees when less grass is available?  
A field study in Kruger National Park, South Africa

Emily R. Goldberg and A. Carla Staver  
Yale University, Ecology and Evolutionary Biology

Introduction

• Elephants are often a primary cause of savanna tree mortality
  
• The degree of their impact can be unpredictable because they are mixed feeders that eat grass and trees in varying proportions
  
• Some of this variation is seasonal, but much is unexplained
  
Based on previous studies, I hypothesize that grass availability is the main determinant of elephant diet and, therefore, the damage they do to trees.

Research questions

Primary question:
• Is grass biomass correlated with elephant damage to trees?

Clarifying questions:
• Is the proportion of trees in elephant diet inversely related to grass biomass?
• Does elephant damage to trees increase with elephant density?
• Does grass biomass affect elephant density?

Results

Damage to trees is related to elephant density and grass biomass. I found no significant relationships between diet composition and any other factors.

<table>
<thead>
<tr>
<th>Graph 1</th>
<th>Graph 2</th>
<th>Graph 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of trees damaged</td>
<td>Elephant density (individuals/m²)</td>
<td>Grass biomass (kg/ha)</td>
</tr>
<tr>
<td>More elephants → More damage</td>
<td>More grass → Fewer elephants</td>
<td>More grass → Less damage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>p = 0.125</th>
<th>p = 0.020</th>
<th>p = 0.115</th>
</tr>
</thead>
<tbody>
<tr>
<td>R² = 0.166</td>
<td>R² = 0.127</td>
<td>R² = 0.115</td>
</tr>
</tbody>
</table>

Location and methods

Kruger National Park, South Africa, is a large and well-studied park with a sizeable elephant population.

Using pre-existing datasets, I searched for relationships between:
• Grass biomass  
• Elephant density  
• Elephant diet composition  
• Elephant damage to trees

Conclusions

• Yes, greater grass availability is associated with more elephant damage to trees
• However, this may be due to elephant landscape use rather than diet preferences

These data can be used to help predict the damage we can expect from elephant populations in different environments. This will be particularly relevant as global warming leads to long-term rainfall and temperature shifts that may change the availability of grass in the landscape.

Literature cited


Acknowledgments

I would like to thank SANParks and Codron (2006) for their generous provision of data for this project, and Professor Carla Staver for her mentorship.

Further information

Please contact me at emily.goldberg@yale.edu for further information.